Is An Outer Space Arms Control Treaty Verifiable?

Paula A. DeSutter, Assistant Secretary for Verification, Compliance, and Implementation
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As prepared

Thank you for your kind invitation once again to address the Institute. The Marshall Institute serves as an important forum conducting serious study and facilitating public dialogue on critical foreign and national security issues.

Anyone who looks at the "Space Security and National Defense" page on the Marshall Institute's web site can see the complex range of issues that the United States has addressed in space policy over the past eighteen months. These include the release of the President's National Space Policy, China's direct ascent anti-satellite test in January 2007, and the growing international interest in transparency and confidence building measures.

Marshall's web site also features an excellent article by its President, Jeff Kueter, which ran in the February 21st issue of *USA Today.* In this column, Jeff very ably responded to the paper's mistaken editorial conclusion that the recent U.S. engagement of an uncontrollable National Reconnaissance Office satellite should "reignite" interest in binding treaties to quote "prevent space from becoming the final battle ground."

As Jeff noted, "Few criticize the U.S. decision to attempt the destruction of a fully fueled, disabled spy satellite before it crashes to Earth. Using missile-defense assets to further minimize the risk of harm is commendable."

Knowing the Institute's long-standing role in promoting unbiased and scientifically accurate assessments of space security issues, I wasn't surprised when Jeff told me that Marshall was making plans for a panel discussion in the coming weeks to review the technical aspects of this engagement and possible lessons for U.S. space policy. Such expert reviews – a hallmark of the Institute's efforts to improve the use of science in making public policy – are one of the most fitting ways to carry on the legacy of Dr. Robert Jastrow and the other founders of the Marshall Institute.

Our Verification Approach

With that context, let me move to the central theme of my remarks today: the enduring challenge of verifying any outer space arms control agreement. Let me begin by saying that, as the international community continues to debate the merits of pursuing outer space arms control agreements, governments must address two fundamental questions: First, are the restraints contemplated in such agreements verifiable? Second, if not, would such agreements nonetheless enhance the security of the parties to such agreements, or actually harm their security?

In trying to reach an overall verification judgment regarding any proposed bilateral or international agreement, the United States seeks to answer two questions:

> First, we seek to determine if the proposed agreement is technically verifiable. To do so, we weigh the proposed limitations, the clarity of the language by which the limitations are expressed, and our ability to detect noncompliance in a timely fashion, using both our

own national means and methods of verification and possible treaty-mandated or agreed-upon cooperative measures. The result of this process is a judgment as to the “degree of verifiability” of the agreement.

Second, we address the issue of whether the proposed agreement is effectively verifiable. This second, broader assessment aims to establish whether the “degree of verifiability” is sufficient to enable the United States to detect significant noncompliance, or a pattern of noncompliance, early enough to counter the threat presented by a violation and deny a violator the benefits of its wrongdoing. We must also evaluate the risk of undetected cheating prior to a “break out” for a regime. Such “effectiveness” judgments are informed not only by the factors considered in reaching judgments regarding the degree of verifiability, but also by the broader context, including the compliance history of the parties to the potential agreement, the risks associated with noncompliance, and the difficulty of responding to deny violators the potential benefits of their violations.

It is theoretically possible that we could determine that an agreement is ”effectively verifiable” even when its degree of verifiability is quite low, because the parties have a strong track record of compliance, the risks associated with noncompliance are low, and/or the ease of detection and response is high. Similarly, there could be agreements that do not have a sufficient degree of verifiability to overcome concerns about the track record of other potential states party, the security risks of undetected cheating, and/or the difficulty, once cheating is detected, of responding on a timely basis to deny a violator the benefits of its violation.

Verification and Outer Space

So, using this calculus, let us examine the notional verifiability of potential space arms control agreements. We begin with the issues of what a possible treaty might hope to accomplish and what types of constraints might be contemplated to achieve those objectives.

With regard to objectives and constraints, efforts to pursue space arms control agreements have a long, but undistinguished, history. Most space arms control proposals have putatively sought to accomplish one or more of four objectives: (1) prevent an arms race in outer space; (2) prevent the placement of weapons in outer space; (3) prevent the threat or use of force against objects in outer space; and/or (4) prevent the development, testing, deployment, and/or use of terrestrial-based anti-satellite weapons (ASATs). I must note that the focus of these objectives is neither to ensure that a space faring nation like the United States has secure ground stations nor to ensure that we have secure communications between our space assets and ground stations. Nor is the focus to ensure that our space assets – both commercial and governmental – are protected from attack.

To achieve one or more of the four objectives most often posited for space arms control, the vast majority of proposed constraints have sought to ban the deployment, use and, often, the threat of use, of certain capabilities, while permitting other activities explicitly, such as research, development, testing, production, and storage.

There are many scope problems with such proposals, including the fact that there is no – I repeat, no – on-going arms race in space. However, from strictly and solely a verification perspective, a fundamental issue here is a definitional question – that is, which objects and activities are to be defined as covered by the proposed ban or limitation. Absent such definitional clarity, it is exceedingly difficult – indeed, probably impossible – to ascertain whether a given object or activity is compliant with the agreement’s terms.

Let me offer a few salient examples.

When is an object to be considered to be a covered – and prohibited – outer space weapon?

One possible definition would include only space-based devices that were produced or converted specifically to damage or destroy other space-based objects. Such a definition, however, immediately raises the question of intent. How could one determine that an object was *specially produced or converted?* Also, how could one verify, in the event of damage or destruction to a space object, that the

cause of the damage or destruction was the result of genuine error or malfunction, and not deliberate?

Another approach could be to define "outer space weapon" to mean any object in, or transiting through, space that could destroy or damage another object in space. The problem with this approach is that it would need to include all objects in or transiting space, since any such object could, at least theoretically, have the inherent capability to strike another object and cause damage to it or destroy it. Moreover, would it be permissible to attack a ground tracking station, which performs a critical role in providing access to space and in the use of space, but which is not itself located in space?

Such an approach obviously would be unworkable. It would constrain – if not force the end of – legitimate uses, such as defense, civil, commercial, intelligence, and non-weapon military satellite functions that are critical not only to the United States, but also to global security, commerce, science, and research. In this regard, it easily could capture and prohibit the deployment of ground-launched, non-weapon systems such as, for example, an unmanned replacement for the U.S. Space Shuttle, which is the workhorse of the International Space Station. Furthermore, it would capture important systems designed for other, non-counterspace missions, due to their inherent anti-satellite capabilities. These would include missile defense systems whose purpose is to destroy ballistic missiles launched from the ground at other objects on the ground, and terrestrial-based ballistic missiles.

Second, what activities would constitute either the use of or threat to use force?

Again, we are faced with a definitional issue. How are the terms, "use of force" and "threat of force," to be defined? How does intent enter into the definition? Is action against one's own space-based object considered to be a hostile – or a covered – action if it destroys or alters that object, because it would confirm a capability to destroy or alter any object in space? What if the action is simply a close pass-by?

Clearly, the fact that a space object has been destroyed, or has sustained damage or injury, or that its parameters have been altered is detectable with high confidence by the satellite owner and, in some instances, by the National Technical Means (NTM) of other states. The attribution of such an action to another state may be possible with high confidence in the case of a direct intercept or of a collision with an object known to belong to that other state. However, identification (as an attack) may not be possible if the other state denies that its action was deliberate. Further, identification (as an attack) and/or attribution (to a state) may not be possible in other instances – e.g., if there were no observable intercept or collision, as in the case of a remote, covert telemetric attack on the software of the object's operating system or if the damage were caused by "space debris." Attribution also could be a challenge with certain types of launches, e.g., from locations at sea.

Moreover, in the absence of documentary evidence or public statements to that effect, it would be extremely difficult, if not impossible, to determine with certainty that such action was deliberate, i.e., intentional, as noted previously. Neither NTM nor cooperative measures, such as data

exchanges or on-site measures, can be depended upon to shed any light on this issue. (Indeed, the acquisition of information to shed light on this issue from any source is likely to be fortuitous, at best, and subsequent independent confirmation in most instances will be unachievable, at least in a timely fashion.) Most, if not all, detected actions that affect the objects in space of another state likely would be alleged by the suspected state to be the result of an error, malfunction, or unintended consequence of a legitimate act; determining in a timely fashion that the actions in question were deliberate would be virtually impossible. Even patterns of action likely would be explainable in this way. For example, if one of the 2,600 pieces of trackable space debris of the nearly 100,000 estimated pieces of debris resulting from the Chinese ASAT test of January 2007 were to strike and destroy the satellites of other states, would such an event be considered to be an unintended consequence of a legitimate action or a prohibited use of force?

With respect to defining an action as a prohibited threat to use force, the challenge is even greater. Verifying straightforward, verbally communicated threats is easy. Determining and getting international agreement that other actions constitute a threat to use force because they demonstrate a capability to put space-based assets at risk, however, is far more problematic. The challenge is likely to be quite high, given the definitional issues that I have raised, which affect judgments as to intent and as to whether particular actions are covered, as well as the inability of verification means and methods to overcome determined efforts to obscure capability as well as intent.

For example, did the January 2007 Chinese ASAT interception constitute a threat to use force against other states' objects in space? It clearly demonstrated a capability to destroy an object in space, and other states clearly viewed it as such. Depending on the language in a treaty text, though, such a test might fail to meet the criteria for constituting a threat, since it involved only testing against a satellite belonging to the launching state. Furthermore, would the deployment of long-range ballistic missiles be construed to demonstrate a threat to assets in space, since the Soviet Union demonstrated such a capability with a co-orbital ASAT launched on space launch variant of its SS-9 ICBM in the 1970s and 1980s?

Means and Methods

I am suggesting that current verification means and methods do not enable us to overcome determined efforts to obscure capabilities and intent. Fair questions, then, would be: what are these means and methods and how well can they detect noncompliance?

Let me begin by noting that virtually all space arms control proposals call for verification, but none has identified specific tools envisioned for the "verification toolbox" that could be used for this purpose. This, to me, suggests that no one has been able yet to identify tools that could do the job effectively.

Presumably, any reasonable approach to verifying a space arms control treaty would anticipate that NTM would be among the permitted verification tools. These are sensor capabilities that sometimes are deployed on satellites for the remote observation of ground-based activities; other NTM may be deployed in other modes. Other tools that some have suggested include data declarations and on-site inspections of satellites, their payloads, and the locations where they are produced, stored, and/or launched – assisted, where appropriate, with technical sensors that on-site inspectors might carry with them or permanently emplace.

We know that NTM capabilities would, in most instances, enable states to detect the fact of a launch and monitor its trajectory. We also know that data exchanges could provide basic information on the numbers, types, and locations of permitted systems, thereby possibly enabling a state to have an "order of magnitude" assessment of the breakout potential of other states. Further, on-site inspections may be able to help confirm this information, although protecting

legitimate commercial proprietary and national security equities might mean that they could never be intrusive or detailed enough to go beyond providing a general confirmation of data.

However, even with the most intrusive and extensive of on-site inspections, a key question remains: what would one look for to verify intent? How could one construct an inspection regime that would provide definitive information on whether activities and items visited or observed were to be used for hostile purposes or were explicitly deployed for prohibited hostile purposes? It is not even necessary to consider how exceedingly difficult this task would be, were a state intent on cheating. This is an exceedingly difficult task in any event, given the dual-use nature of many space assets and activities. In the world of arms control, in the absence of definitive information, it is exceedingly difficult – indeed, many would argue, virtually impossible – to reach actionable conclusions in a timely fashion.

I mentioned earlier that most space arms control proposals have permitted research and development into the very kind of activities whose deployment would be banned. The breakout potential for permitted R&D to support banned deployment activities is obvious. However, it also is worth noting that verifying the fact of research and development and the purposes for which such R&D were undertaken also present huge challenges, particularly if that R&D has few, if any, external signatures, such as tests. A very real concern, even when indications or evidence of R&D can be acquired, is whether sharing that information would expose sensitive sources and methods, possibly putting lives at risk. Even if that hurdle could be crossed, given the dual-use nature of these technologies, confirming that such activity is acquired or developed to support a banned program is highly problematic – particularly in closed societies.

Is Undetected or Undetectable Cheating Possible?

Unfortunately, even with all of these tools, undetected and undetectable cheating remains quite possible. Neither National Means and Methods of Verification (NMM) – which include but go beyond NTM – nor negotiated cooperative measures (including declarations and on-site inspection of satellites and their payloads prior to their launch) would enable verifiers to determine with confidence whether an activity circumvented or exploited loopholes in the definition of banned activities, or could be rapidly converted for prohibited uses. For example, the rendezvous and docking operations conducted by an automated cargo transfer vehicle could be used to conceal the development of co-orbital ASAT guidance, navigation, and control subsystems. Similarly, a test to confirm the ability to hit a target in space could be concealed in a launch that resulted in a close fly-by of a target satellite or a point in space.

Moreover, neither NMM nor negotiated cooperative measures (including declarations and on-site inspection of satellites and their payloads prior to their launch) would enable verifiers to determine with confidence whether observed changes in orbiting satellites or payloads were due to malfunctions, or deliberate actions as a result of either covert modifications or inherent capabilities. Even the most intrusive of on-site measures prior to launch – measures whose acceptability, for commercial or national security reasons, to *any* nation is highly doubtful – could do no more than indicate the maneuvering capability of a given system and the degree of sophistication of that capability. Additionally, maneuvering capabilities are the norm for satellites. Neither NMM nor negotiated cooperative measures would enable verifiers to determine with more than low-to-very low confidence whether the intent of that capability extended beyond normal operating and safety requirements. Even then, it would be highly possible for a state to hide its true intent or change it quickly, and to take the necessary actions to exploit a latent or covert capability.

One plausible cheating scenario would be to develop seemingly peaceful satellites with sufficient latent maneuvering capability that they could, upon command, leave their specified orbits and kinetically attack other satellites. Such a capability might require only modifications that either might not be detectable or could reasonably be explained as logical safety or operational

improvements, e.g., to enable maneuvering to avoid space debris. If a satellite routinely received encrypted commands and suddenly veered off-orbit, it would be impossible to determine whether the loss of orbit was due to a malfunction or was a deliberate plan to test or exercise a capability to attack another satellite.

Another plausible cheating scenario could be to launch and orbit satellites that contain hidden secondary satellite-interceptor payloads, or payloads with a covert interceptor capability. Hidden secondary payloads could be impossible to detect with NTM; even very intrusive inspections – including of a type unlikely to be acceptable, for commercial and national security reasons – might be unable to detect the fact of a hidden secondary payload. Even if an inspection detected such a payload, it likely would be unable to determine the purpose of the secondary payload, particularly if steps were taken to hide its true purposes.

Are There Legal Means by Which Constraints Can Be Circumvented? Do Those Legal Avenues Provide Reasonable or Effective Means for Breakout?

There would be a high potential for rapid and effective breakout in any treaty that focused its prohibitions exclusively on space-based activities. Under such a scenario, a country could develop, produce, and maintain a supply of ground-based direct-ascent ASAT interceptors, as well as co-orbital interceptors in storage. On the other hand, such a space-based approach would preclude precisely those U.S. programs that are intended to protect the peaceful use of space and other security threats.

In this regard, it is important to remember that a relatively small number of countries already are exploring and acquiring capabilities to counter, attack, and defeat the space systems or the ground-based components of such systems of other nations. These include capabilities for jamming satellite links and blinding satellite sensors; anti-satellite systems designed to destroy or damage satellites in orbit; and capabilities for interfering with or destroying the ground relay stations, communications nodes, and satellite command-and-control systems that support and/or operate space-based assets.

Responding to Cheating: Do Viable Response Options Exist in the Event That Cheating or Breakout Is Detected?

Before response options can be pursued, there first needs to be agreement that cheating or a plan for breakout has occurred and warrants response. Even in cases where a party to a legally-binding agreement might have a history of employing denial and deception techniques or a spotty compliance record, achieving agreement on identifying certain actions as noncompliant would be uncertain. There is a correspondingly high risk, therefore, that it would be difficult or impossible to garner the necessary support for countering those risks in a timely fashion to deny violators the potential benefits of their violations. Moreover, many proposals for additional space arms control measures would prohibit some of the most promising defensive response options.

As noted in the President's Space Policy, an attack on our space assets would be an attack on a vital U.S. national security interest. Would our options for response be any greater if we could also note that such an event might be a violation of an arms control agreement?

Conclusions

After considerable review, my government has concluded that it does not support additional arms control restrictions on space activities. Only part of the reason we have come to this conclusion has to do with the foregoing verification issues. Put broadly, we have reached this conclusion for two reasons: First the types of restrictions that have been suggested by some states and some non-governmental groups are not verifiable. Second, even if they could be made verifiable, which

we believe they could not, they would unduly constrain legitimate self-defense, commercial and other activities.

As our National Space Policy makes clear, the United States will oppose the development of new legal regimes or other restrictions that seek to prohibit or limit U.S. access to or use of space. Proposed arms control agreements or restrictions must not impair the rights of the United States to conduct research, development, testing, and other operations or activities in space for U.S. national interests. Thus, we do not support such binding arms control approaches.

That is why, in part, the Bush Administration has concluded that additional arms control restrictions on space activities beyond the existing Outer Space Treaty are not necessary. In our view, the Outer Space Treaty is sufficient to meet today's and tomorrow's needs. It establishes guiding principles for space operations by all nations: that space shall be free for all to explore and use; that space activities shall be carried out in accordance with international law, including the Charter of the United Nations, which guarantees the right of self-defense; that weapons of mass destruction shall not be put into orbit; that States Party shall not interfere with the assets of other states; and that States Party shall bear responsibility for the activities carried on by governmental and non-governmental entities in territories and locations under their jurisdiction and control. These are the principles according to which space faring nations have and should continue to conduct themselves.

We do not need to enter into new agreements. Rather, we need universal adherence to the existing Outer Space Treaty and to the other existing international conventions designed to provide for cooperation in space and to promote an understanding of the obligations associated with being responsible space faring nations. It is for these reasons that the United States will continue to encourage others in the international community to examine the prospect of space arms control with a critical eye.

The President's Space Policy highlights our national and, indeed the global, dependence on space. The Chinese interception only underscored the vulnerability of these critical assets. Calling for arms control measures can often appear to be a desirable approach to such problems. Unfortunately, "feel good" arms control that constrains our ability to seek real remedies to vulnerabilities have the net result of harming rather than enhancing U.S. and international security and well-being.

Thank you.